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DATAMATION 88 BUDGET SURVEY

DATAMATION

APRIL 1, 1988
A CAHNERS PUBLICATION

An Affordable Window of Technology Opens

Pc-Based Expert Systems Arrive

Plus:

- Tandem's NonStop Networking Deals
- Economic Modeling Turns to Graphics
- How Improved is IBM's DB2?
- Probing the New Posix Standard

DATAMATION

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Cover Illustration by Andrea Baruffi

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1988 JESSE H. NEAL AWARD

1987 JESSE H. NEAL AWARD

Editorial

Inspired By Music (IBM)

Recently in this space, it was suggested that IBM's reorganization is in part an attempt to reassert the control it once enjoyed over the computer industry. This is highly improbable; if it truly held this goal, its premier new component would not have been IBM United States, but the IBM Div. of Recording Arts & Sciences.

Anyone who has studied the issue closely appreciates music's role in IBM's drive to preeminence. Consider this passage from *Fortune*, January 1940: "Thus officially having shaken hands with culture, the Spirit of IBM has embraced it often. It had been many years, at any rate, since business had felt the thigh of culture so publicly. . . on Thurs., May 4, 1939 . . . the IBM Symphony, written especially for the occasion by Vittorio Giannini, was broadcast . . . the first movement suggesting excitement and the struggles of mankind; the second, its yearnings for peace and beauty . . . the third movement mixes up the national hymns of the various countries with that of IBM, thus pointing to the day when international cooperation shall be the human race." *Fortune* went on to note, "The composition is gratifyingly short, and not hard to listen to."

Fortune, of course, is not necessarily expected to display any understanding of the arts.

A more thrilling testament to the vitality of IBM's musical heritage is the 1969 album "Paean." Pressed by the Advanced Computer Techniques Corp., the album features the performances of the Association of British Secretaries in America Ltd. Who else could do full justice to such songs as "To Thomas J. Watson": *Pack up your troubles—Mr. Watson's here/And smile, smile, smile/He is the genius in our IBM/He's the man worth while/He's inspiring all the time/And very versatile—oh!/He is our strong and able President!/His smile's worth while.* (Perhaps this is the place to comment that this is all true, including the thigh of culture, Mr. Watson's smile, and the British secretaries.)

Can anyone deny that IBM was in better health when it displayed a full commitment to music? And can this be mere coincidence? More disconcerting, IBM has left open the possibility that third parties will begin to write songs based on the IBM model. For example, what if Jon Bon Jovi writes "To John F. Akers" to the tune of "You Give Love a Bad Name"? Not promising, is it? And he's a professional. Why, *you* might even write an IBM song. Does IBM want more clones on its hands? Perhaps this is the only activity it understands—competition, a lesson clearly taught by a seminar in April Foolishness.

Steven Korn

STEVEN KORN COPY CHIEF

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ABP ABC BPA

Letters

Doing Justice

"Is the Computer Fostering a More Just Justice System?" (Jan. 15, p. 45) could well leave uninformed readers with the notion that computers are not really used to any great extent in our justice system.

Such is not the situation here in Alabama where our centralized State Judicial Information System has been providing case-expediting tools to our major circuit and district courts for over seven years with the following results:

- Case filing backlogs of up to three months have been eliminated.
- Court-ordered payments are receipted and disbursed on-line.
- Previously labor-intensive tasks are now by-products of our systems—indexing, various types of court notices, executions, cost bills, fee sheets, warrants, subpoenas, driver's license suspension and clearances, etc.
- Juror qualification, summons, and reimbursement have been streamlined, resulting in significant monetary savings for taxpayers.

Currently, in conjunction with one of the state's larger law firms, a trial study is being conducted whereby the firm is using its in-house pc to access our records for its county. The savings for the firm have been significant: instead of sending its law clerks (attorneys) to the courthouse to research cases in which they are involved, the research is done from their own office.

JOHN J. O'SULLIVAN
Manager/Judicial Data Center
Administrative Office of Courts
Montgomery, Ala.

Vertically Driven

In "The Winds of Change are Blowing for MRP II Users" (Feb. 1, p. 19) it was stated, "MRP II's limited appeal is partly because vendors have attempted to make their packages all things to all people, rather than customizing them for vertical markets." I beg to differ! The manufacturing software industry has many vertically driven marketing organizations. We are one of them.

Martek has been in business since 1981. Our AIMS program (Advanced Integrated Manufacturing Software) offers the printed circuit board industry a totally integrated system for order entry and tracking, inventory and purchasing control, and production scheduling and material requirement business functions. Currently, over 90% of our customer base is in the PCB business. We have a special product for a particular industry. We feel it is a must for the software vendor to understand the environment of the industry it is trying to serve. By understanding the manufacturing environment of the PCB industry, we have been able to come up with a totally integrated solution for all of their software needs. To be "vertically" market driven seems to be the only way the software vendor can ensure the quality of his product to the particular industry that he serves.

MICHAEL G. BABUSKOW
Marketing
Martek Inc.
Westmont, Ill.

Passing the Test

Although "Strategy Implementation: Passing the Systems Test" (Feb. 15, p. 67) is excellent, it does not go far enough. In order to nip problems in the bud, I feel it is most important to thoroughly test predevelopment requirements, resources, and design plans before any coding begins. In addition to the obvious, these plans should address all life-cycle considerations that may affect quality, including goals, funding, staffing, facilities, interdependencies, hardware, complementary and supportive software, as well as postdevelopment maintenance and enhancement schedules.

The problem categories—technical, functional, and procedural—are certainly important. However, to these I would add iteration, because it is most important to understand that retesting costs can be prohibitive unless measures are taken to reduce ongoing effort while maintaining the original sample. Only the smallest automation projects are ever completed in one pass.

GERRY B. LYON
Senior Analyst
Product Assurance & Support
Micro Products Group
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Camarillo, Calif.

Corrections

Due to a typesetting error, an early, unfinished version of a story about the IBM announcement of extensions to MVS/XA was published on p. 17 of the March 1 edition of DATAMATION.

In "The German Connection: A Roundtable" appearing in the International Edition (March 1, p. 92-9), the name of Hartmut Blechschmid was misspelled.

We apologize for the errors.

The 1988 DATAMATION Budget Survey shows IS spending up about 9%. With this increase, IS says it will deliver a 25% boost in computer power. More than 90% of IS executives say the market crash has had no effect on their 1988 budget. Micros will take about a quarter of the average IS budget, but, in small companies, the pc bite rises sharply.

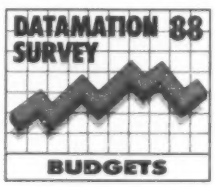
Budget Survey: More for Your Money

BY PARKER HODGES

This year, IS is seeking a whole lot more bang from just a few more bucks. That's one of the findings of this year's DATAMATION Budget Survey. The average 1988 MIS budget is about 9% above what it was in 1987. But IS managers report that, with this money, they expect to deliver an average 25.5% increase in computing power over 1987.

Norman Berger, director of MIS at Gitano, a manufacturer and distributor of sportswear based in Edison, N.J., expects to double his computer power this year. "We're adding a Spectrum 950 from Hewlett-Packard," says Berger, who also reports that growth has been "tremendous" at his firm. He originally planned to replace his three HP 3000s—two Model 70s and one Model 45—with the Spectrum. But he says that it now appears that he will keep at least one of the 3000s.

Berger also offers some good news in regard to the effects of last October's stock market crash. "Our growth remains strong," he says of Gitano, which has revenues that will top the $500 million mark this year.



The survey reveals that Berger's experience is typical: so far, most IS budgets have not been affected by the crash. Fully 91% of the respondents replied that the crash has had no effect whatsoever on their 1988 budgets.

But among those whose budgets have been hurt by the crash, reactions vary widely. One respondent from a state agency in Washington reports that "the state has reduced all agency budgets by 1%" and adds ominously that budgets "could be reduced further."

At a management services firm boasting over $500 million in 1987 revenues, a vice president of IS reports that in response to the crash he will be making "no purchases in the first quarter of 1988." A systems manager from a bank in the Southeast responded to the crash with a burst of patriotism, saying his operation is "staying with brand names versus Asian clones."

Personnel Gets the Lion's Share of the Average Budget

Overall, the largest chunk of the average IS budget continues to be earmarked for personnel: just over 41% of 1988 budgets will be spent on personnel, up very slightly from 1987's 40.7% (see "Where Does the Money Go?").

However, a company's size makes a big difference in the size of personnel's bite of the budget. As a general rule, the bigger the company is, the larger the percentage of the budget devoted to personnel. But the growth curve isn't smooth.

Companies with under $1 million in revenues report personnel taking an average of 34.4% of the budget. Raise the revenues to $5 million, and personnel still takes just 36.3% of the budget. When company revenues enter the $5 million-to-$9 million range, the personnel percentage rises sharply, hitting an average 43%. Further growth apparently doesn't appreciably change the average percentage of the budget devoted to personnel: for the most part, it hovers between 43% and 45%, with a slight upturn to 47.4% for companies and organizations with revenues falling between $1 billion and $9 billion.

How many paychecks do these percentages represent? The mean number of employees reporting to the IS department at the end of 1987 was 18.7. Respondents predict that that total will rise to 19.3 by the end of 1988. Of course, the number of a company's IS employees is coupled with the number of its total employees. At companies where the total number of employees is under 100, the average number of IS employees is 6.1. The number rises to an average of 74 at companies employing between 5,000 and 7,499 people, falling back to just over 70 at companies employing between 7,500 and 9,999, and to an average of about 61 at companies that employ more than 10,000.

Both Hardware and Software Purchases Remain Constant

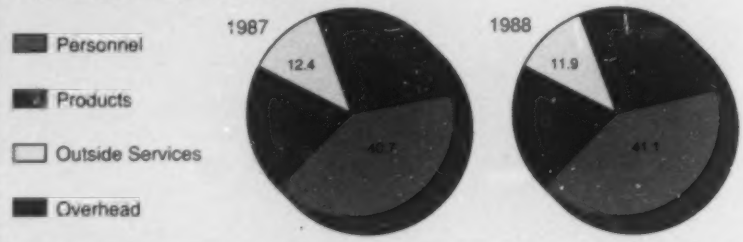
There was very little change in the budget bite taken by the purchase of products, for both hardware and software: at 27.4% it was up a shade from 1987's 27%. Again, the size of the company has a lot to do with the amount that's penciled in for products. In this case, however, the smaller the company, the more of its resources it spends on products: companies with revenues under $1 million spend more than a third of each IS dollar on products; most larger companies spend about a fourth of each IS dollar on products.

Overhead, including support for existing products, was down a little, falling to 19.6% from 19.9%; outside services will also take a smaller piece of the budgetary pie, dropping 0.5%, to 11.9% from 12.4%.

In some shops, outside services are taking a bigger piece of the budget this year. For example, Rick Bareuther, dp man-

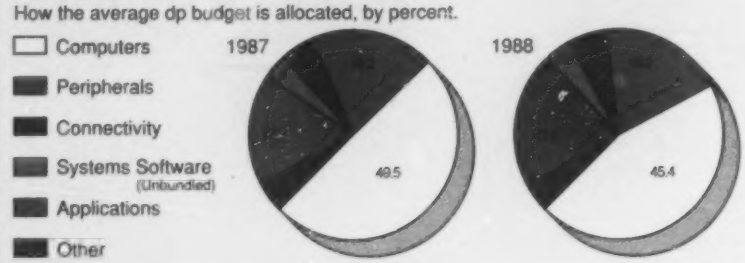
Where Does the Money Go?

The average IS budget, allocated by percent



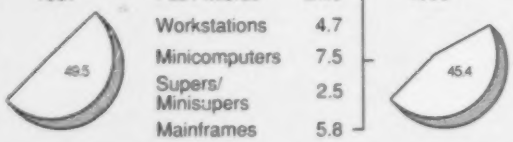
Slicing the Purchase Pie

How the average dp budget is allocated, by percent.



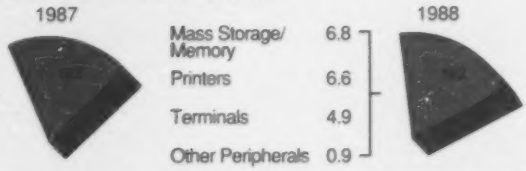
How the Computer Market Breaks Down

	1987		1988
Pcs / Micros	28.5		24.9
Workstations	4.9		4.7
Minicomputers	7.8		7.5
Supers/ Minisupers	2.6		2.5
Mainframes	5.6		5.8



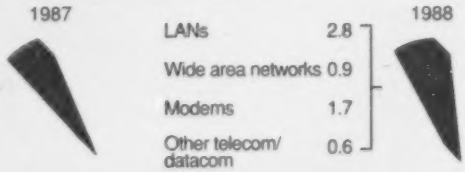
How the Peripherals Market Breaks Down

	1987		1988
Mass Storage/ Memory	5.9		6.8
Printers	7.4		6.6
Terminals	5.1		4.9
Other Peripherals	0.8		0.9



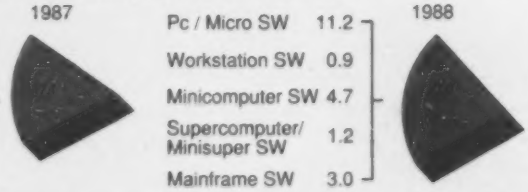
How the Connectivity Market Breaks Down

	1987		1988
LANs	1.8		2.8
Wide area networks	0.9		0.9
Modems	2.0		1.7
Other telecom/ datacom	0.8		0.6



How the Applications Software Market Breaks Down

	1987		1988
Pc / Micro SW	9.4		11.2
Workstation SW	0.7		0.9
Minicomputer SW	3.7		4.7
Supercomputer/ Minisuper SW	0.9		1.2
Mainframe SW	2.4		3.0



ager for the city of Sparks, Nev., tells DATAMATION that his department is "spending a considerable amount of money on outside training" on new applications that automate "police records and geographic information."

Pcs Dominate 1988 Hardware Budgets

For hardware vendors, the message delivered by 1988 budgets depends on what they make (see "Slicing the Purchase Pie"). Makers of microcomputers will take the biggest piece of the purchase action: a hefty 24.9% of what the average company or institution will spend on information technology equipment in 1988 is earmarked for pcs. But will this make the pc merchants happy? Maybe not. The survey population reports that a year ago it had committed 28.5% of its 1987 budget to pcs. Still, since 1988 budgets are up, the slightly lower pc percentage should keep pc sales healthy, if not soaring.

No matter how large or how small the company, the pc still takes the biggest piece of 1988's purchasing pie. But it is understandable that at small companies, with revenues under $1 million, the pc's share soars, accounting for almost a third of every dollar spent on purchases of hardware or software.

Apart from pcs, the percent of the purchases represented by other categories of computers was virtually unchanged from 1987. Still, because of the pc's smaller share of the purchase dollar, the overall share of the average budget that has been committed to the purchase of computers—micros, workstations, minis, supercomputers, and mainframes—is off from what the respondents spent in 1987, down to 45.4% from last year's 49.4%.

In particular industries, however, some classes of hardware are moving faster than in others. While minicomputers represent a mean of 7.5% of 1988 IS equipment and software purchase budgets, acquisitions of this machine type will account for about 15% of purchases in the manufacturing and retail sectors. Likewise, mainframe computers, which take a mean 5.8% of the average purchase budget, take a bigger bite in food and beverages (13.3%), insurance (12.1%), transportation (14.1%), and utilities (15.3%).

The mainframe is the focus of this year's budget for Robert V. Sprowl, director of management information services for the San Bernardino Community College District, San Bernardino, Calif. Sprowl tells DATAMATION that his move

from an old Burroughs 6810 to a Unisys A5 and the expansion of his budget for storage came because "the state levied new requirements. We have gone from tracking 85 data elements to tracking 240 data elements."

Shaking Up the Peripherals Mix

The survey reveals that respondents plan to change the mix of peripherals they're adding to their systems this year. Last year, printers took far and away the largest hunk of the dollars that IS spent on peripherals. This year, fulfilling a classic IS strategy to boost computing power without buying new computers, the action has moved to mass storage and memory: they will account for almost 7% of the dollars MIS spends on information technology in 1988.

Viewing the peripherals picture through an industry by industry lens, the big spender on storage and memory will be the insurance business, where it will account for more than 10% of 1988's product budget. This is not surprising, given this industry's huge appetite for database space.

Purchase of connectivity equipment is also more intense in some industries than others. Responses to this survey suggest that in 1988, the action in local area network installation will be concentrated in two sectors. LANs will take a mean 2.8% of the average purchase budget, but in the electronics and process industries, this element of the connectivity puzzle gets a lot more attention, 12% and 10%, respectively. Less money is being devoted to wide area networks, taking only about 1% of the average purchase budget; but here, too, the electronics industry leads the pack by a wide margin, devoting an average 8% of its buying budget to wide area networks.

Software purchase budgets also vary widely, depending on the industry. Pc software gets big play at companies in manufacturing (16.9%), petroleum (21.8%), and utilities (17.7%). The transportation industry is buying workstation software (4.9%). Big buyers of mainframe software are the health care industry and the insurance industry—over 6% of the purchase budget, compared with the cross-industry mean of 3%.

While decentralization is a reality, the mean number of people outside the IS department who have buying or specifying power over IS purchases is holding fairly steady from 1987 to 1988, rising to an average of 9.5 people from 1987's 9.1. At small companies—fewer than 100 employees—an average of 1.8 people in the non-IS sphere is shopping for information technology. In companies with up to 249 employees, an average of 3.5 people outside IS can specify what's bought.

In larger organizations, the number ranges all over the lot. What pulls the entire average up are the responses from IS executives at companies that manufacture computers and other IS equipment: buying and specifying power for information technology is up slightly from 1987 and is held by an average of 45.6 people outside IS at these companies, a fourth of which have over 10,000 employees.

Overall, however, 27% of the respondents reported that no one in their organizations outside the IS department could buy or specify IS equipment. And another 16% report that only one person outside dp/MIS is so empowered.

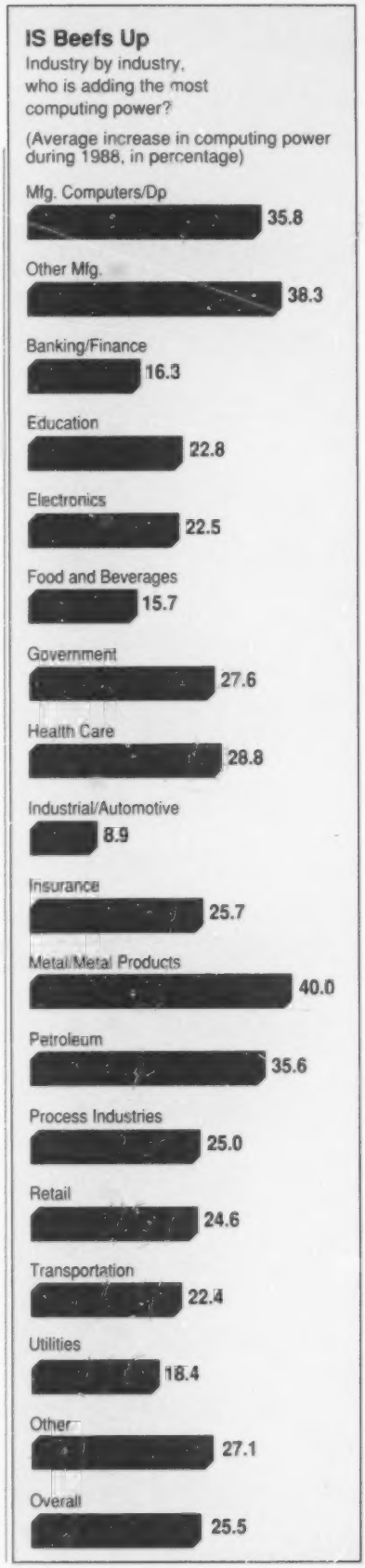
Nailing Down Budget Authority

This year's questionnaire asked if organizations had capital budgets for IS equipment separate from the specific IS budgets. Just under 30% of the respondents reported that, yes, their organizations had such a capital budget for IS equipment.

Next, the questionnaire asked who exerts primary authority over these separate capital budgets. IS pros should be happy to learn that in 27.5% of the responses, vice presidents and directors of IS run the capital budgets as well as their own IS budgets. Nor should it come as any surprise that the biggest influencers of these capital budgets are ceos, chief operating officers, and chief financial officers: where such capital budgets exist, 55.9% of the respondents say the primary authority is held by these top officers. At manufacturers of computers and dp equipment, marketing and engineering vps have important capital budget clout: 21% reported the power lies with marketing; 21% reported the power is in the hands of engineering. At industrial and automotive companies, 50% of the respondents report the force is with the engineering vp. Among others described as having purchasing authority were budget committees, plant managers, and owners and partners in businesses. ■

Methodology

On Dec. 21, 1987, questionnaires were mailed to a random sample of 3,000 DATAMATION subscribers whose titles are within company management or computer/systems management. The sample was limited to one name per site. By Jan. 12, 1988, 700 completed questionnaires had been returned, a response rate of 23.3%.



EXPERT SYSTEMS

DATAMATION/PRICE WATERHOUSE SURVEY

End Users Are Key to Success

BY KIT GRINDLEY

The U.S. has taken a slim lead in the use of expert systems. The DATAMATION/Price Waterhouse International Special Survey on Expert Systems shows that 25% of U.S. corporations have put expert systems to use so far, compared to 23% of Japanese companies and merely 11% of U.K. firms.

Nevertheless, corporate IS executives are still uncertain and often confused about the effectiveness of expert systems technology. In fact, some questionnaires from the 476 U.S. survey respondents were returned with the simple query, "What is an expert system?"

With today's growing reliance on specialized expertise in business, and on the expensive experts who dispense it, the future of expert systems looks rosy. So why haven't even more people begun to use them in the U.S.? By far, the most important reason the survey respondents cite is a lack of awareness in U.S. companies of the potential scope and benefits of expert systems. Sixty-four percent of companies state that this is the main reason why they had made little progress in this area.

"It's not so much they [corporate management] don't know what expert systems are," comments one U.S. IS exec. "I guess I've explained that. But they can't relate the concept to corporate needs. The way I see it, we need to use them before we see where to use them!" That brings the expert systems pioneer up against the second most frequently mentioned problem—50% of U.S. IS executives report that finding suitable applications for expert systems technology is a major difficulty.

The companies that report the most success have delegated the task of finding applications to the users.

One IS executive comments, "If I'm asked to give an example, I start talking about the problem of configuring hardware. We've used an expert system to help us solve this problem, and it's something I know about. But the users don't relate to it. They think I'm talking about another toy for the computer department. They use expertise in marketing, in personnel, in finance—sure, but none of these are my field. The breakthrough came when we got a shell for finance to play with on their own. Nothing happened for six months. But then they came up with a couple of applications we couldn't have dreamed of." (Shells are expert systems software frameworks; they become expert systems when human experts have filled in the blanks, depositing their expertise within the so-called shell.)

The survey shows that the number of installations where end users find their own expert systems applications is expected to increase by more than half in three years' time, rising to 43% from the present 27%. Decentralization also helps with the other two main problems: acceptance by users (mentioned by 49%) and cost-justification (mentioned by 44%). "The only IS dollars the users don't criticize are the ones they spend themselves" is a piece of wisdom offered by one IS executive.

But decentralization doesn't altogether solve the "acceptance by users" problem. While the medicine may be self-prescribed, it doesn't taste any better. "I'm meeting user resistance at the implementation stage," says one respondent. "Experts seem worried that they're going to have a 'professional lobotomy.' I tell them, 'You don't have to accept the computer's conclusion. It's just advice. You're still in charge.' Right now, we have a problem with the union. There's a seven-figure savings at the end of our latest expert system, but they won't accept it on the shop floor."

Another major problem, which 40% of U.S. companies mention, is the shortage of technical skills that are required to design the diagnosis questions and to supply the answers or rules needed to produce an effective expert system. No programming skill is required, only the ability to express know-how. The survey shows that slightly more U.S. companies (17%) have developed expert systems using shells than have attempted to manage without them (14%).

Interviews reveal that IS executives do not consider the use of shells to be a suitable strategy for all applications. "They make it quick and easy to specify rules and condition chains," says one IS manager, "but if you want to do more, like work out probabilities, some will do it but it's tough going. You might as well write the system yourself, especially since these more complex applications are the sort that usually need to be integrated with your existing database and systems."

Integrating expert systems with existing systems is acknowledged by many respondents to provide the payoff. It was also found to be one of the major problems, mentioned by 47% of companies.

Only 14% of installations believe expert systems will become a major area of computer applications within three years. A massive 72%, however, are convinced that expert systems will one day be effective; the out-and-out heretics, who believe they will never be of any use, constitute only 14%.

From an international perspective, the U.S. represents the highest level of optimism about expert systems. Heretics in Japan accounted for 19% of the respondents, while in the U.K., 28% say they expect the technology never to be of any use.

Only 9% of Japanese companies claim to have put expert systems shells to practical use, compared with 16% of U.S. companies, but the picture is reversed when it comes to developing expert systems from scratch. Sixteen percent of Japanese companies, compared with 11% in the U.S., claim to have tailor-made expert systems up and running. What's more, although only a small

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- **The U.S. leads Japan in the acceptance and use of expert systems.**
- **In the U.K., 28% believe expert systems will never be of any use.**
- **Half of U.S. IS executives report that finding suitable applications for expert systems technology is a major difficulty.**
- **Expert systems are most accepted in companies where end users identify the applications.**
- **The integration of expert systems with existing systems and databases provides the real payoff.**

PRESENT USE OF EXPERT SYSTEMS

■ Companies with expert systems in use, by percent

SYSTEMS DEVELOPED USING EXPERT SYSTEMS SHELLS:

	JAPAN	U.K.	U.S.
None	90	93	[illegible]
One to five	9	6	[illegible]
Six to 20	0.5	1	3
More than 20	0.5	-	1

SYSTEMS DEVELOPED WITHOUT USING SHELLS:

	JAPAN	U.K.	U.S.
None	84	95	88
One to five	10	5	9
Six to 20	3	-	1
More than 20	3	-	2

GRAND TOTALS (adjusted to account for companies which report they use both methods of developing expert systems, by percent)

	JAPAN	U.K.	U.S.
Active in some way (developing or using shells, tailor-made systems, or both)	26	15	26
Put at least one expert to use	23	11	25

ORGANIZING EXPERT SYSTEMS DEVELOPMENT

■ Who is responsible for identifying applications for expert systems?

Now.....

	JAPAN	U.K.	U.S.
Users	23	18	27
IS Dept.	74	81	67
Outside Consultants	3	1	6

Three Years From Now.....

	JAPAN	U.K.	U.S.
Users	32	38	43
IS Dept.	63	60	53
Outside Consultants	5	2	4

■ Who is responsible for developing applications?

Now.....

	JAPAN	U.K.	U.S.
Users	18	9	13
IS Dept.	73	86	77
Outside Consultants	9	5	10

Three years from now.....

	JAPAN	U.K.	U.S.
Users	31	28	25
IS Dept.	59	67	67
Outside Consultants	10	5	8

PROBLEM AREAS

■ Areas needing improvement before expert systems can become more widely used. (No. of mentions; some companies mentioned more than one.)

	JAPAN	U.K.	U.S.
Avail. of tech. skills	26	31	40
Finding applications	58	53	50
Cost justification	23	37	44
Suitability of pc shells	9	8	19
Suitability of mainframe shells	10	7	16
Validating results	47	5	15
Availability of methodologies	24	11	26
Maintaining the knowledge base	25	14	28
Corporate awareness of potential	29	66	64
Acceptance by experts	8	10	16
Acceptance by users	19	25	49
Capturing experts' knowledge	29	22	35
Support from outside specialists	7	2	4
Integration with existing systems	32	29	47
Delivering operational systems	36	24	38

number (66%) of Japanese companies have made considerable use of tailor-made expert systems (i.e., more than six systems installed); this important core of pioneers is double that found in the U.S.

The U.K. holds its own in developing shell-based systems. The British dropout rate is much higher, however, with only about half the systems developed actually put into practical use. The survey provides no evidence of a U.K. company making considerable use of tailor-made systems. The low profile there may be explained by the fact that it also lags behind in user initiatives in finding suitable applications. Nevertheless, both the U.S. and the U.K. believe the future lies with users identifying suitable applications. The Japanese have greater faith than these two Western countries that users will be able to develop their own systems. This is a surprising result in view of the low use of shells in Japan, but may be explained by their policy of internal recruitment and subsequent recirculation of its staff back into user departments.

Japan appears to be untroubled by the top problem shared by the U.S. and the U.K. concerning expert systems—the lack of corporate awareness—and by the U.S.'s number three problem, the lack of acceptance of the technology by users. Clearly, Japan's bid to lead the world into the fifth generation of information technology has the informed backing of management. This commitment to the new technology may turn out to be a damp squib, however, since Japan shares with its rivals the difficulty of finding suitable applications. In fact, this is Japan's chief difficulty, mentioned by 58% of companies surveyed there. During interviews following the survey, one of the most successful U.S. companies advised, "Keep it simple. We set our sights too high at our first attempt. A knowledge base we estimated at 300 rules finished up at over 1,000 and still didn't cover the problem. Now we don't try to solve the problems of the world. The secret is in drawing boundaries." ■

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FUTURE IMPACT OF EXPERT SYSTEMS

■ Expert systems in major applications, by percent

	JAPAN	U.K.	U.S.
Within three yrs.	16	14	14
Sometime	65	58	72
Never	19	28	14